

What is claimed is:

- 1 1. A method of forming at least one fin extending from a substrate
2 comprising the steps of:
3 providing a fin layer of semiconductor on said substrate;
4 depositing a first hardmask on said fin layer;
5 patterning said fin layer to form at least one fin block;
6 reducing the transverse dimensions of said first hardmask above said at least
7 one fin block by an amount greater than or equal to the thickness of two
8 fins;
9 forming a second hardmask about and adjacent to said first hardmask;
10 removing said first hardmask, leaving at least one etch aperture in said
11 second hardmask having a width equal to a fin separation distance between
12 adjacent fins; and
13 etching said fin layer through said at least one aperture to form said at least
14 one fin.
- 1 2. A method according to claim 1, in which said step of reducing
2 comprises etching vertical sides of said first hardmask with a wet etch.
- 1 3. A method according to claim 2, in which said first hardmask
2 comprises a layer of nitride above a layer of oxide.

1 4. A method according to claim 3, in which said fin layer comprises
2 silicon and said wet etch is a mixture of HF and EG.

1 5. A method according to claim 1, further comprising a step of
2 lithographically defining an aperture extending over one side of a member
3 of a set of fin blocks after said step of forming said second hardmask and
4 before said step of removing said first hardmask.

1 6. A method according to claim 2, further comprising a step of
2 lithographically defining an aperture extending over one side of a member
3 of a set of fin blocks after said step of forming said second hardmask and
4 before said step of removing said first hardmask.

1 7. A method according to claim 1, further comprising a step of
2 lithographically defining a blocking mask over an end portion of said set of
3 fin blocks, thereby preventing said end portion of said set of fin blocks from
4 being separated.

1 8. A method according to claim 2, further comprising a step of
2 lithographically defining a blocking mask over an end portion of said set of
3 fin blocks, thereby preventing said end portion of said set of fin blocks from

4 being separated.

1 9. A method according to claim 5, further comprising a step of
2 lithographically defining a blocking mask over an end portion of said set of
3 fin blocks, thereby preventing said end portion of said set of fin blocks from
4 being separated.

1 10. A method of forming a set of fins extending from a substrate
2 comprising the steps of:
3 providing a fin layer of semiconductor on said substrate;
4 depositing a first hardmask on said fin layer and forming at least one
5 aperture in said first hardmask;
6 patterning said fin layer through said first hardmask, thereby extending said
7 at least one aperture into said fin layer and defining two fin blocks flanking
8 said at least one aperture in said fin layer;
9 expanding the transverse dimension of said at least one aperture in said first
10 hardmask relative to the transverse dimension of said at least one aperture in
11 said fin layer by removing a portion of said first hardmask above each of
12 said two fin blocks, thereby exposing a corresponding portion of each of
13 said two fin blocks with a predetermined width;
14 forming a second hardmask within said at least one etch aperture;
15 removing said first hardmask; and

16 patterning said fin layer through said second hardmask to form at least one
17 fin with said predetermined width from each of said two fin blocks.

1 11. A method according to claim 10, in which said step of expanding
2 comprises etching substantially vertical sides of said first hardmask with a
3 wet etch.

1 12. A method according to claim 11, in which said first hardmask
2 comprises a layer of nitride above a layer of oxide.

1 13. A method according to claim 12, in which said fin layer comprises
2 silicon and said wet etch is a mixture of HF and EG.

1 14. A method according to claim 10, further comprising a step of
2 lithographically defining an aperture adjacent to one side of said second
3 hardmask after said step of forming said second hardmask and before said
4 step of removing said first hardmask.

1 15. A method according to claim 11, further comprising a step of
2 lithographically defining an aperture adjacent to one side of said second
3 hardmask after said step of forming said second hardmask and before said
4 step of removing said first hardmask.

1 16. A method according to claim 10, further comprising a step of
2 lithographically defining a blocking mask over an end portion of said set of
3 fin blocks, thereby preventing said end portion of said set of fin blocks from
4 being separated.

1 17. A method according to claim 11, further comprising a step of
2 lithographically defining a blocking mask over an end portion of said set of
3 fin blocks, thereby preventing said end portion of said set of fin blocks from
4 being separated.

1 18. A method according to claim 14, further comprising a step of
2 lithographically defining a blocking mask over an end portion of said set of
3 fin blocks, thereby preventing said end portion of said set of fin blocks from
4 being separated.

1 19. A method of forming a set of fins extending from a substrate
2 comprising the steps of:
3 providing a substrate with a fin layer of semiconductor;
4 depositing a first hardmask on said fin layer;
5 patterning said fin layer with a set of fin separation apertures;

6 expanding the transverse dimensions of said fin separation apertures above
7 said fin layer by an amount greater than or equal to the thickness of two
8 fins;
9 filling said fin separation apertures with a second hardmask;
10 removing said first hardmask, leaving a set of etch apertures in said second
11 hardmask having a width equal to a fin separation distance between adjacent
12 fins; and
13 etching said fin layer through said etch apertures to form said set of fins.

1 20. A method according to claim 19, in which said step of expanding
2 comprises etching substantially vertical sides of said first hardmask with a
3 wet etch.

1 21. A method according to claim 20, in which said fin layer comprises
2 silicon and said wet etch is a mixture of HF and EG.

1 22. A method according to claim 19, further comprising a step of
2 lithographically defining an aperture extending over one side of a member
3 of a set of fin blocks after said step of forming said second hardmask and
4 before said step of removing said first hardmask.

1 23. A method according to claim 20, further comprising a step of

2 lithographically defining an aperture extending over one side of a member
3 of a set of fin blocks after said step of forming said second hardmask and
4 before said step of removing said first hardmask.

1 24. A method according to claim 19, further comprising a step of
2 lithographically defining a blocking mask over an end portion of said set of
3 fin blocks, thereby preventing said end portion of said set of fin blocks from
4 being separated.

1 25. A method according to claim 20, further comprising a step of
2 lithographically defining a blocking mask over an end portion of said set of
3 fin blocks, thereby preventing said end portion of said set of fin blocks from
4 being separated.

1 26. A method according to claim 24, further comprising a step of
2 lithographically defining a blocking mask over an end portion of said set of
3 fin blocks, thereby preventing said end portion of said set of fin blocks from
4 being separated.